ISO 9001:2015 certified

Metallurgical Solutions, Inc.

Specializing in High Speed and Tool Steels

Here at Metallurgical Solutions, Inc. we have expanded our capabilities. We've just added a very small, custom built, internal quench furnace to our arsenal. It was primarily developed as a regular internal quench furnace and for oil quenching heat treated parts while under a protective atmosphere. This furnace will also allow us to carburize or carbonitride a customer's work with very shallow case depths. The process is followed by top, slow cooling, and then salt bath austenitizing in our salt baths with a salt quench. This combination produces parts with higher toughness and minimal distortion compared to parts austenitized and directly oil quenched in the furnace.

One of the keys to producing repeatable, accurately controlled, shallow case depths is doing the work in small loads (i.e., small furnace). The temperature and atmosphere distribution throughout the load must be uniform, and the furnace must be able to recover to the carburizing or carbonitriding temperature in a short and predictable time.

Control of the atmosphere and temperature is accomplished by the most sophisticated temperature/atmosphere control panel available today. Temperature is controlled by a digital solid state controller working with an SCR to hold the temperature very stable and accurately to the programmed set point. The carbonaceous atmosphere is measured and controlled by an oxygen probe/controller combination driving automated flow meters, all a part of the United Process Controls/Waukee Accumixor control panel.

Since 1989 Metallurgical Solutions, Inc. has supplied the highest quality high-speed steel salt bath hardened parts. This new furnace will now allow us to provide the same high quality case hardened work for our customers.

Contact MSI at 401.941.2100 for more information on how we can work for you.

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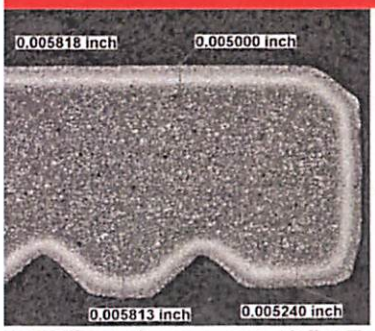
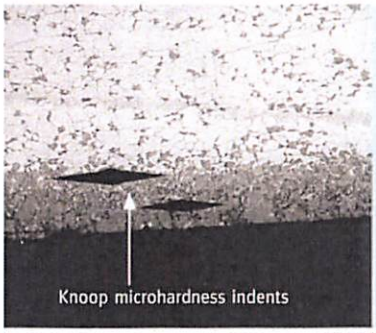


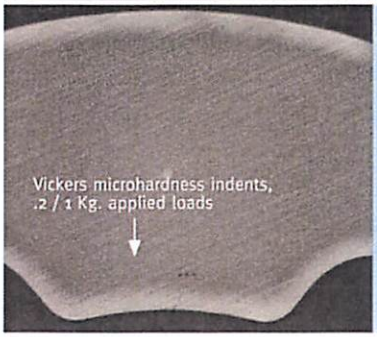
50x

16MnCr5 low carbon - low alloy steel trigger bar used in a 9mm semi-automatic pistol. Carburized case depth requirement to an effective case depth of 513 Vickers is specified as 0.004" / 0.006". The fine grained microstructure in the carburized case is high carbon lightly tempered martensite having a hardness of 701 to 733 Vickers. The core microstructure is low carbon tempered martensite having a hardness of 380 to 390 Vickers. Note the uniformity in the depth of the carburized case. Case hardness requirement is 650 / 750 Vickers.



250x

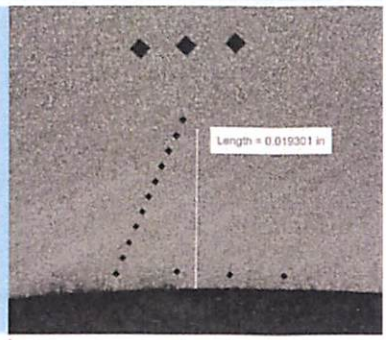
Hardness of carburized case in low carbon steel part, measured using a Knoop microhardness testing procedure. The carburized case depth is 0.003" to 0.004". The carbon content at the surface is ~ 0.80% eutectoid pearlite. General microstructure in the carburized case is composed of fine grained lamellar pearlite. The core microstructure consists of ferrite (white matrix phase) and pearlite (dark phase).



15x

Uniform carburized case hardened surface in an AISI 9310 alloy steel Gas block for a 9 mm semi-automatic pistol / rifle. The effective case depth to a hardness of 513 Vickers measured 0.019". Case depth requirement: 0.016" / 0.020". The case hardness ranged from 720 to 733 Vickers. The core hardness measured 407 to 413 Vickers. The case and core microstructures are high and low carbon tempered martensite respectively.

100x



Our Services

- Salt Bath Heat Treatment (1000 to 2300°F) of high speed, tool steels, carbon/low alloy steels and gray/ductile iron casting using salt, air or oil quenching
- Air Tempering
- Steam Tempering
- Salt Tempering
- Stress Relieving
- Annealing
- Solution Annealing
- Precipitation Hardening
- Martempering
- Austempering of Steel & Ductile Iron (ADI)
- Cryogenic Deep Freeze
- Hardness Testing
- Straightening
- Induction Heating
- Consulting Engineering/Failure Analysis
- Non-Destructive Testing
- Carburizing/Direct Quench
- Salt Bath Ferritic Nitrocarburizing (FNC)

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